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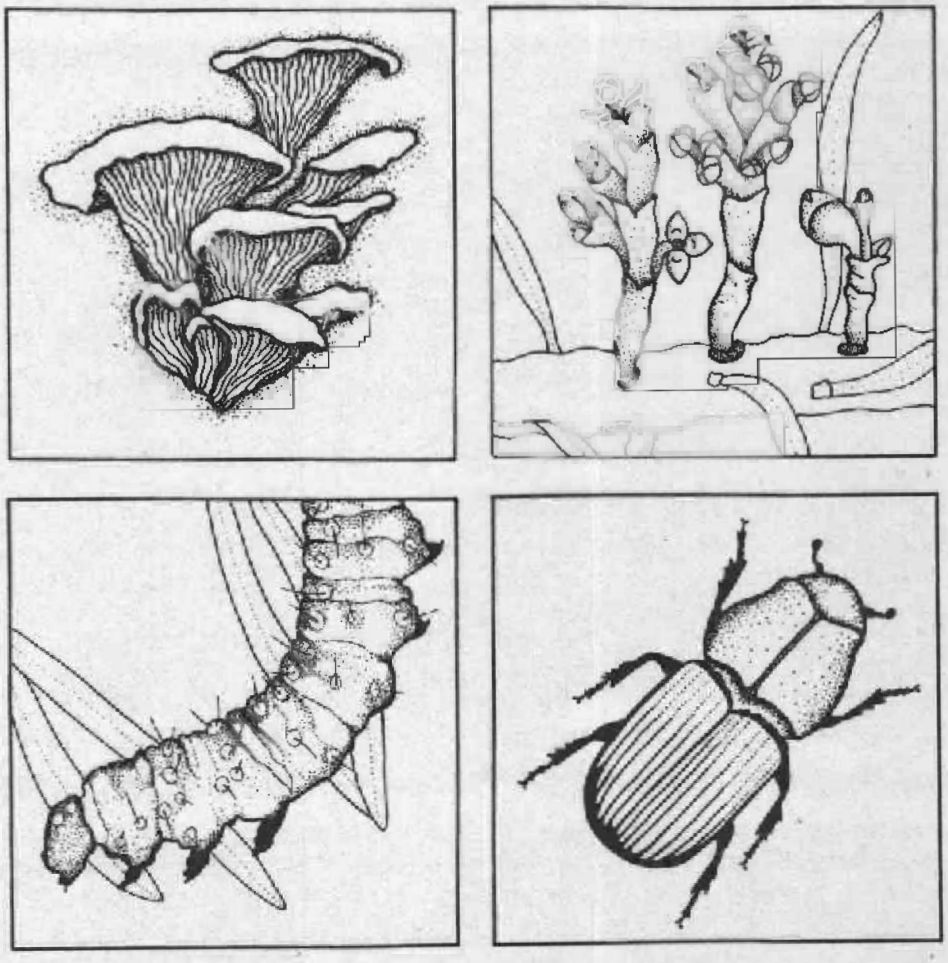

CANKERS OF RUSSIAN-OLIVE SEEDLINGS AT THE MONTANA STATE FOREST TREE NURSERY, MISSOULA, MONTANA

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ABSTRACT

Fungi associated with cankers of Russian-olive seedlings at the Montana State Nursery, Missoula, were investigated. Phomopsis elaeagni was most often isolated from and fruiting on cankers. Other associated fungi were Phoma herbarum, P. eupyrena, P. chrysanthemicola, P. exigua, Alternaria alternata, Epicoccum nigrum, and Fusarium moniliforme. Because of its common occurrence on cankers and its reported pathogenicity on Russian-olive, P. elaeagni is considered the most likely cause of these cankers. Recommendations for reducing future losses from this disease are discussed.

INTRODUCTION

Russian-olive (Elaeagnus angustifolia L.) is a small tree introduced into the United States from southern Europe and Asia (Wyman 1964). The species is well adapted to windy environments and is quite drought resistant (Borell 1971). It is often planted in windbreaks and used to provide cover and food for wildlife.

Russian-olive is grown for windbreak and wildlife plantings at the Montana State Forest Tree Nursery in Missoula. About 90,000 seedlings are produced annually. Although there are usually few problems associated with production of Russian-olive, during the 1982 fall lifting operation many seedlings were culled because of extensive branch and stem cankering. Therefore, an evaluation was conducted to determine possible causes of the cankers and to formulate recommendations to reduce future losses.

Severely cankered seedlings were transported to the laboratory where they were examined; fungi were isolated from tissues within and adjacent to cankers. Associated organisms were identified with the aid of standard taxonomic guides (Barnett and Hunter 1972; Brown and Brotzman 1979; Clements and Shear 1957; Domsch et al. 1980).

Symptoms of diseased seedlings - Diseased seedlings had several cankers on lateral branches and the main stem (fig. 1). Host callus tissue commonly formed on the edge of cankers; gummosis often occurred on callused or cankered tissues (fig. 2). Patches of necrotic bark were underlain with large cankers. Most cankers were located on the side of seedlings where cultivation equipment could have caused injury. Most cankered seedlings lacked foliar decline symptoms. Very few of the cankers completely girdled the stem or lateral branches; extensive die-back symptoms were not found. Examined root systems appeared healthy.

Figure 1.--Canker of Russian-olive seedlings produced at the Montana State Nursery, Missoula. Associated fungi (primarily Phomopsis elaeagni) sporulated on necrotic and adjacent callus tissues.

Figure 2.--Callused over canker on Russian-olive seedling. Note the dark red gum droplet on the callus tissue.

Descriptions of associated fungi - Phomopsis was the most common fungus isolated from and sporulating on cankers. Phomopsis pycnidia were stromatic, carbonaceous, one to several loculate, and erumpent within host bark tissues. In culture, stromata were black and columnar, measuring 850-950 µ in height. Two types of conidia were produced from pycnidia. The first type (designated A) was the most common. They were 1-celled, hyaline, ellipsoid to fusiform, occasionally biguttlate, and measured 1.5-2 µ in width by 6-9 µ in length. The other spores (designated B) were much less common. They were filiform, slightly curved, tapered at one end, hyaline, 1-celled, and measured 15-20 µ in length and 0.8-1.3 µ in width. These characteristics coinicide with the description of P. elaeagni (Carter & Sacamano) Arn. & Carter (Arnold and Carter 1979).

Several species of Phoma were also isolated from cankers. These fungi had pycnidia which were smaller and less stromatic than Phomopsis. Their smaller conidia were hyaline and usually 1-celled. At least four species were identified on the basis of cultural growth characteristics, production of chlamydospores, and reaction with NaOH (which measures production of a specific metabolite) (Boerema and Howeler 1967). The first species was P. herbarum Westend. which was characterized by its blue green reaction with NaOH and its lack of chlamydospores. Two other species were P. eupyrena Sacc. and P. chrysanthemicola Hollos; the former produced characteristic chlamydospores and the latter had pseudosclerotical bodies (Dorenbosch 1970). The other Phoma-like organism isolated from cankers was a fungus that produced predominately 2-celled asymetrically, spindle-shaped conidia. Taxonomic characteristics separating Phoma from other related Coelomycete genera are not clearly defined (Dennis 1946; Sutton 1964). Therefore, although this fungus resembled Ascochyta, it more closely coincided to descriptions of P. exigua Desm. (Boerma and Howeler 1967). Nutritional and pathogenicity studies are probably required to confirm this classification.

Alternaria alternata (Fr.) Keissler was also isolated from cankers. This fast-growing fungus produced chains of brown-pigmented, multicelled conidia with verruculose margins (Simmons 1967).

Other fungi associated with Russian-olive cankers were Epicoccum nigrum Link ex Fr. and Fusarium roseum (Lk.) Sacc. Epicoccum produced black sporodochia bearing dark conidia with several longitudinal and transverse septa (Duncan and Herald 1974; Schol-Schwarz 1959). Fusarium was characterized by slender curved macroconidia with distinct foot cells, absence of chlamydospores, and reddish pigment in culture (Domsch et al. 1980).

DISCUSSION

Cankers of Russian-olive caused by P. elaeagni were first reported in the United States in 1967 (Carter and Sacamano 1967). Although the fungus was initially described as Fusicoccum, it was later transferred to the genus Phomopsis (Arnold and Carter 1979). The disease has been described on older planted trees as well as on nursery stock (Arnold and Straby 1973; Carroll et al. 1976; Carter and Dodd 1969). Although the disease has been reported in the eastern United States and the Great Plains (Morehart et al. 1980; Stack and Lamey 1980), this is the first report of its occurrence in Montana.

Phomopsis elaeagni is characterized by and separated from other similar canker-colonizing fungi by its production of multiloculate stromata and both A and B conidia (Arnold and Carter 1979). The sexual (ascigerous) state of this fungus is thought to be in the genus Diaporthe, although occurrence of both stages on the same host plant has not been reported (Arnold and Carter 1979; Wehmeyer 1933). The fungus commonly infects fresh wounds on stems and branches (Carroll et al. 1976; Stock and Lamey 1980). Although fungal stromata have been reported on the roots of Russian-olive (Arnold and Carter 1979), the fungus apparently does not reside in soil in large numbers like some other canker-causing organisms (Morehart et al. 1980).

Besides causing localized cankers, P. elaeagni can also induce rapid dieback of infected branches or girdle stems causing wilt symptoms (Morehart et al. 1980; White and Ellett 1972). Symptom differences may be due to predisposing environmental conditions, vigor of host trees, or to pathogenic variability of fungal strains (Morehart et al. 1980).

Apparently the Phomopsis strains at the Montana State Nursery were not very aggressive or the seedlings not very susceptible because extensive dieback, wilting, or mortality did not occur. Cankers were localized and very little girdling occurred.

Other fungi isolated from Russian-olive cankers are probably secondary colonizers of cankers initially infected with P. elaeagni Most of these fungi are soilborne and saprophytic, although Phoma eupyrena, P. herbarum, P. exigua, and Alternaria alternata, may be parasitic (Domsch et al. 1980; Dorenbosch 1970; Simmons 1967).

RECOMMENDATIONS

Future damage from this disease can be most effectively reduced by preventing wounding of seedlings (Morehart et al. 1980; Stack and Lamey 1980). Care should be taken to avoid wounding seedlings during cultivation. Maintaining vigorous trees will also reduce chances of infection. Most canker fungi, including P. elaeagni, more successfully infect stressed trees (Stack and Lamey 1980). Therefore, providing adequate water and fertilizer is important in combating this disease. Fungicide treatments to prevent infection have not been reported and are probably unnecessary if cultural practices are adjusted to reduce disease incidence.

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